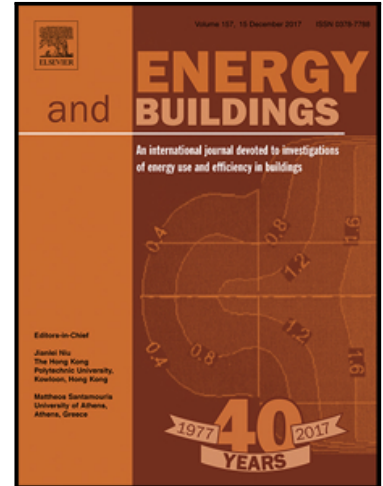


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Article

Innovative Window Design Strategy to Reduce Negative Lighting Interventions in Office buildings

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Abstract: Novel lighting strategies have the potential to create luminous environments that are more satisfactory to building occupants and reduce occupants' interventions in lighting conditions. Testing innovative design systems in the immersive virtual reality (IVR) environment could be a useful approach to investigate these systems quickly and easily. This paper explores how increasing the luminance of areas surrounding the window using an electric wall-washing system could improve subjective rated contrast (RC) scores on the windowed wall, as well as reducing negative lighting interventions in an IVR office room with different window-to-exterior-wall ratios. The results indicate that participants report greater lighting contrast between the window and its surroundings in the room with a 15% window-to-exterior-wall ratio (WWR) compared with other lighting conditions. The findings of this research also show that the proposed electric wall-washing system with a low power level could significantly reduce the likelihood of users' propensity to intervene in lighting conditions in rooms with different window sizes.

Keywords: window design; luminance contrast; lighting satisfaction; lighting intervention; window wall; office space; immersive virtual reality

1 Introduction

In Australia, it is projected that offices will account for 23% of the total energy consumption among buildings by 2020 [1]. Lighting systems are the second highest energy consumption source in

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